Developing a Statewide Monitoring Strategy For Oxbows in Oklahoma

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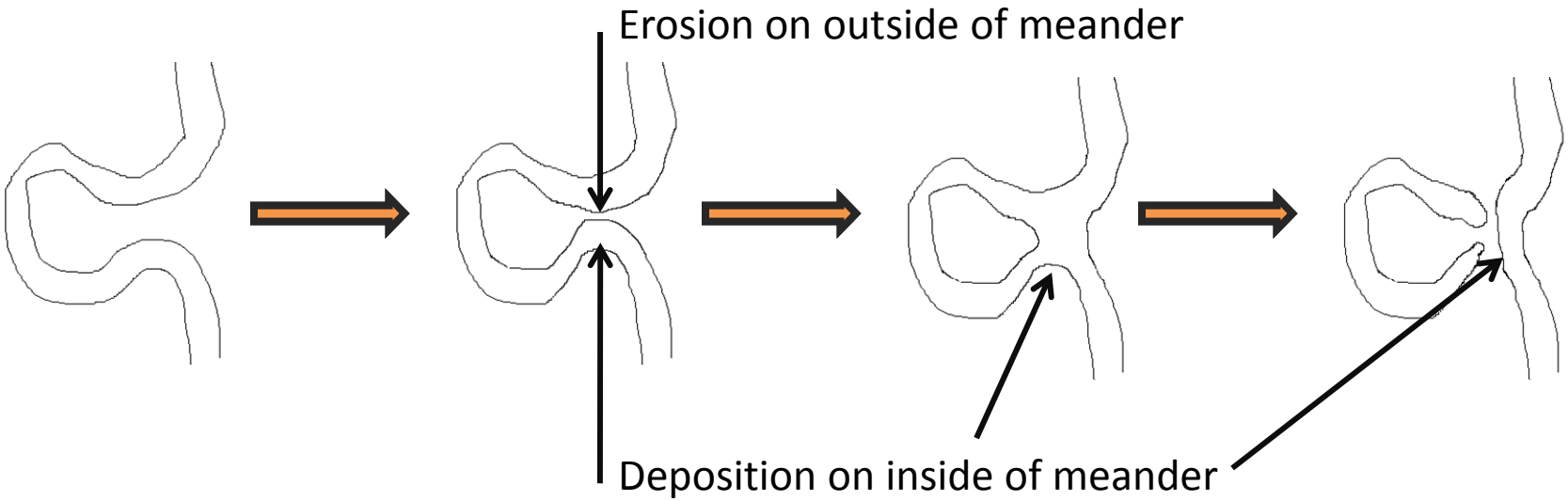
Introduction- Oxbow Formation



Canadian River 2003

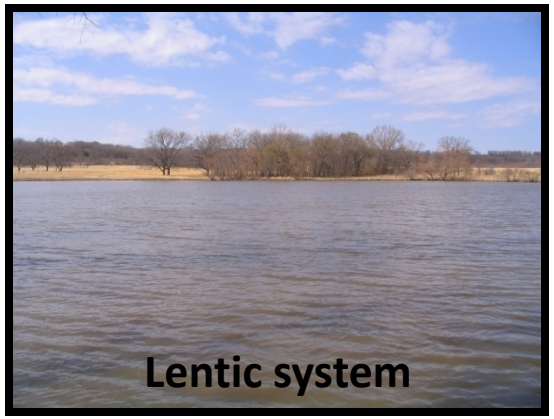
Canadian River 2008

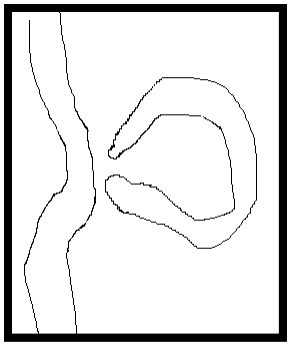
Canadian River 2010

Introduction- Sediment and Hydrology

Sediment inputs into oxbows increase.
Flood events can decrease as rivers meander.

Introduction- Lakes, Rivers or Wetlands?





Introduction- Oxbow Wetlands

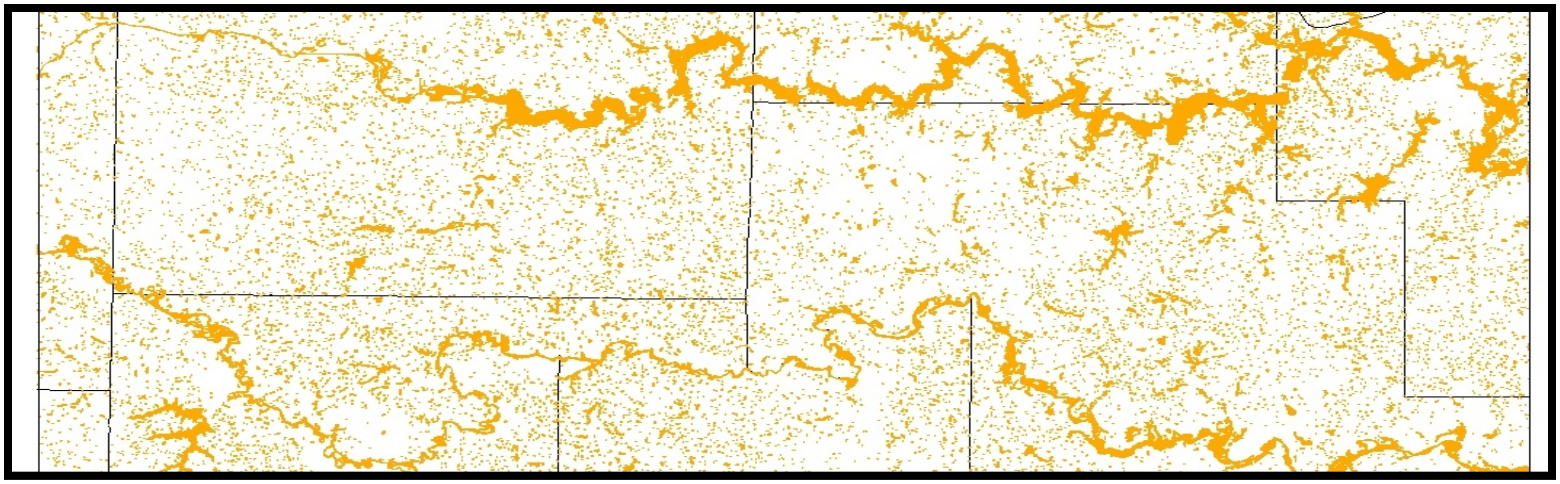
- Hydrology- wet-dry cycles
  - Biota
  - Dissolved Oxygen
  - Nutrients
  - Turbidity

Introduction- Goals

- Estimate number of oxbows and understand spatial distribution
- Create desktop landscape tool to estimate broad patterns in oxbow health
- Determine if lake Use Support Assessment Protocols are appropriate for oxbow lakes and wetlands
- Begin to develop other assessment tools
  - Rapid Assessment
  - Biotic Assessment
- Calibrate desktop tool to site data

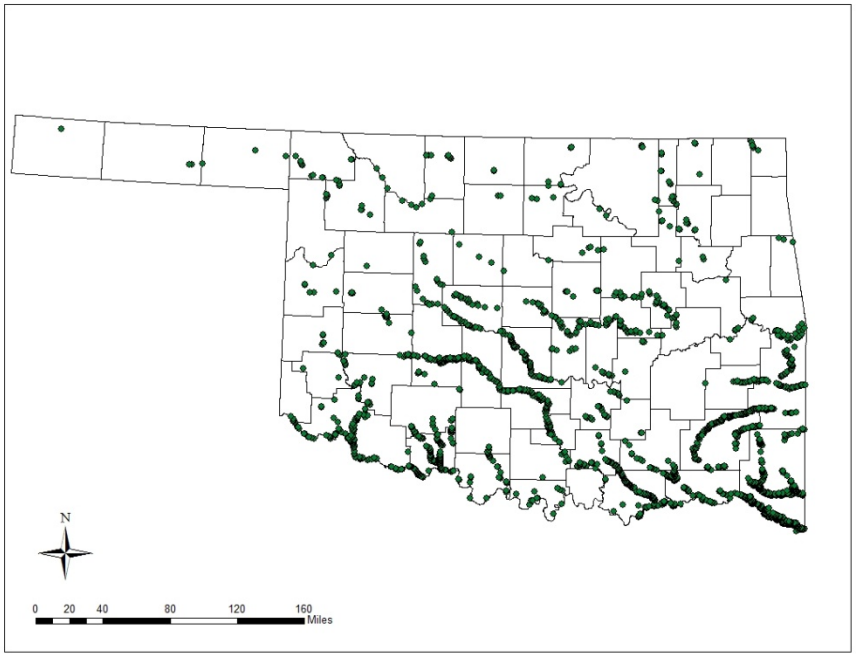
Mapping and Desktop Assessment

- Estimate the spatial distribution of oxbows
  - GIS mapping
- Evaluate landscape condition of oxbows
  - GIS analysis



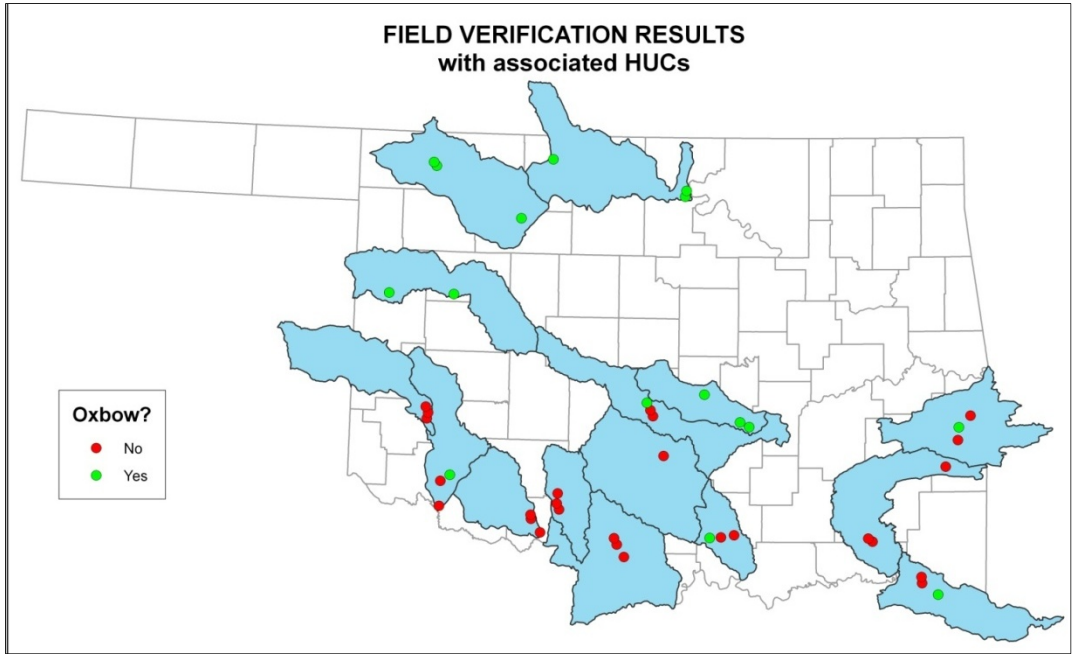
Oxbow Mapping

- NAIP imagery from 2006 and 2008 in GIS
  - National Hydrography Dataset
  - National Wetlands Inventory
- 2,610 Oxbows after first visual inspection



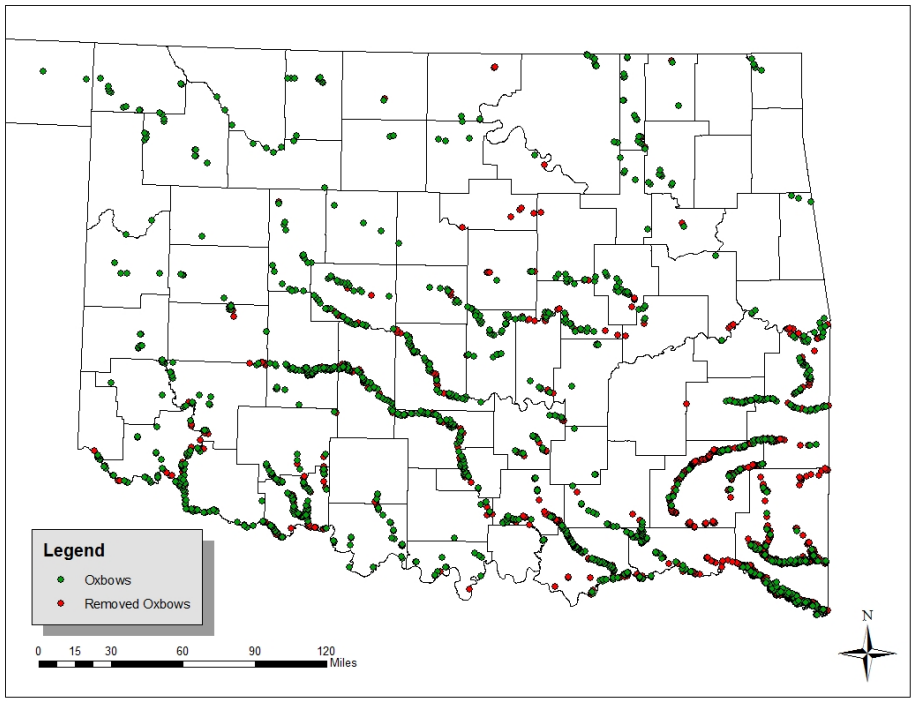
Oxbow Mapping

- Field Verification
  - 44 sites in 15 HUC 8 watersheds
  - 28 of 44 not oxbows or 64% error Rate
  - 36% X 2,610 oxbows = 940 oxbows



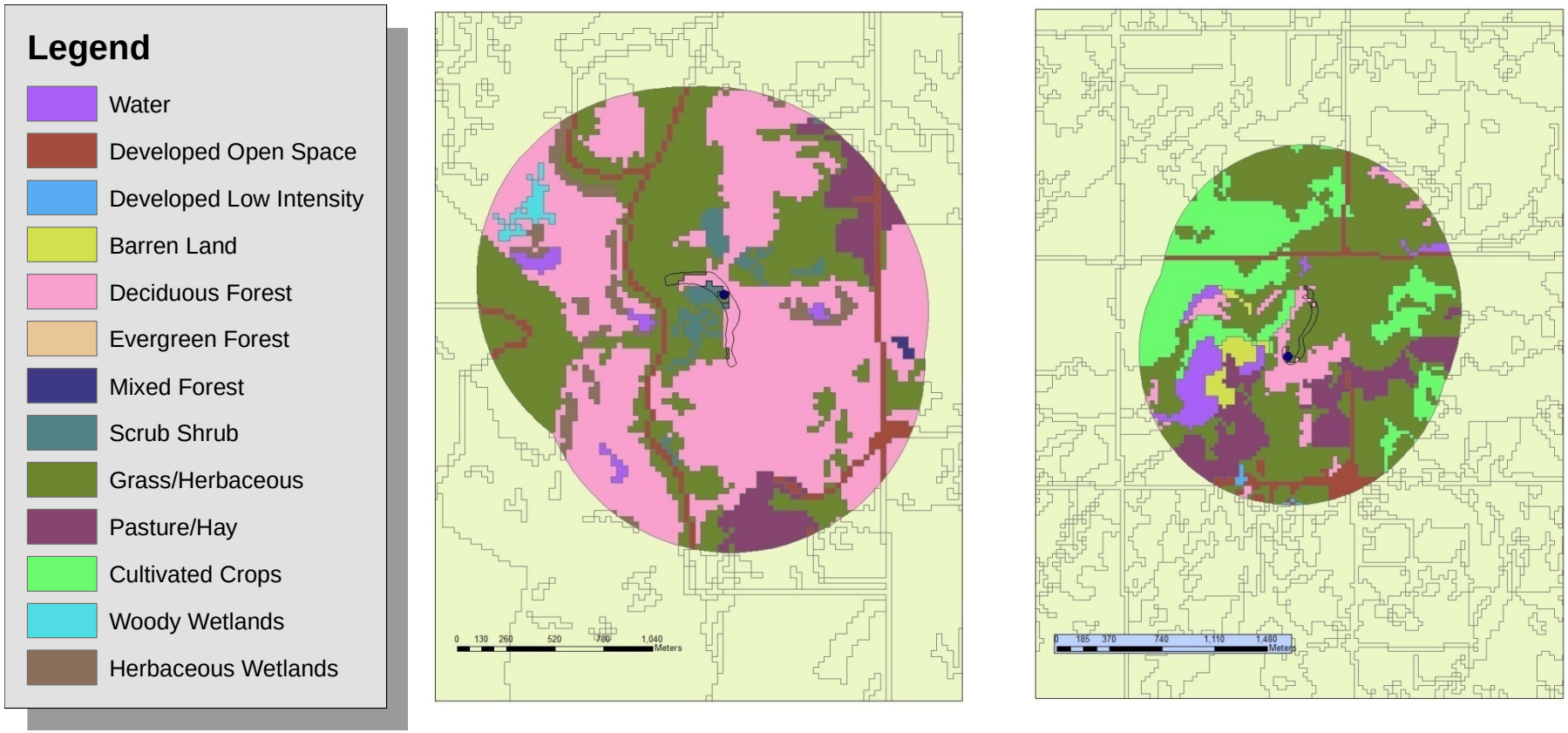
Oxbow Mapping

- Removed 1442 oxbows based on site visits
  - 1,168 oxbows remaining
- 8 out of 24 remaining field verified sites not oxbows
  - error rate = 33%
- 33% * 1,168 = 782 oxbows



Desktop Landscape Assessment

- One hundred randomly selected oxbows-GRTS
- 1 km buffer from boundary (excluding oxbow)



Desktop Landscape Assessment

2001 NLCD Class	Land Use Coefficient
Water	1.0
Developed, Open Space	0.6
Developed, Low Intensity	0.4
Developed, Medium Intensity	0.2
Developed, High Intensity	0.0
Bare Rock/Sand/Clay	0.4
Deciduous forest	1.0
Evergreen Forest	1.0
Mixed Forest	1.0
Scrub/Shrub	1.0
Grasslands	0.8
Pasture/Hay	0.5
Cultivated Crops	0.2
Woody Wetlands	1.0
Emergent Herbaceous Wetlands	1.0

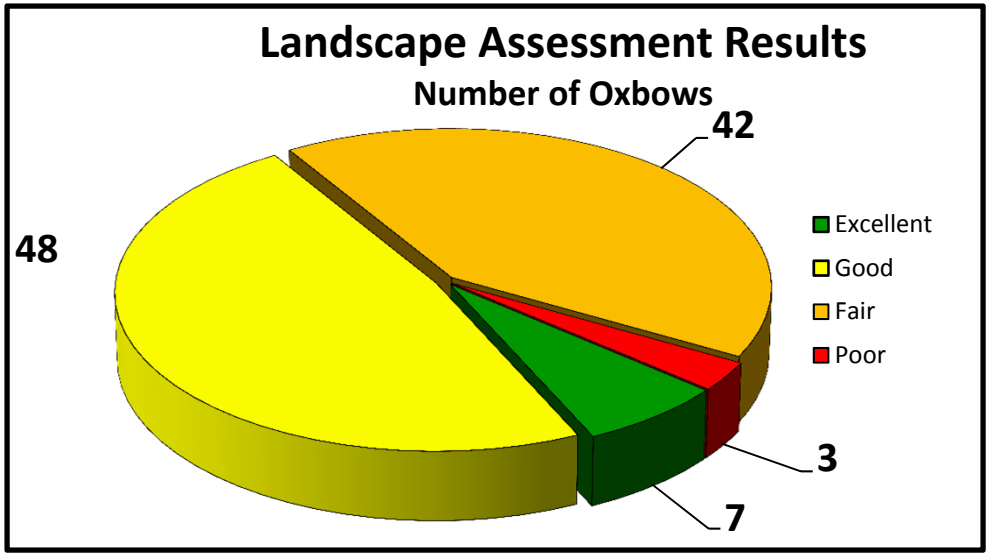
$$\text{Total Land Use Score} = \Sigma \text{ LU} * \text{PC}/100$$

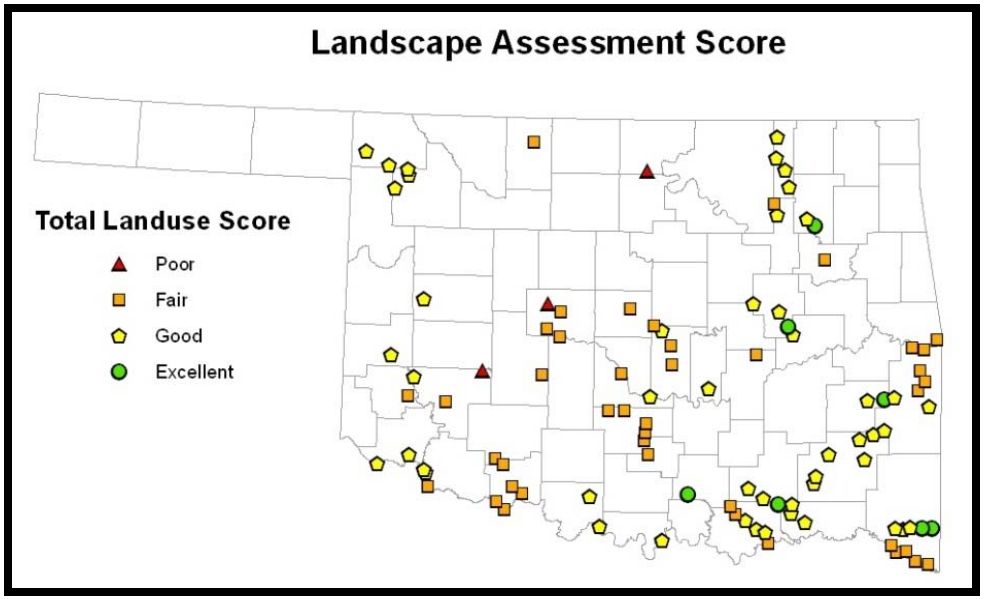
LU = Land Use Coefficient for each land use type

PC= Percent Cover of land area in assessment zone of the land use type

Desktop Landscape Assessment

Condition	Landscape Score Range
Excellent	1-0.95
Good	0.94-0.75
Fair	0.74-0.4
Poor	0.39-0





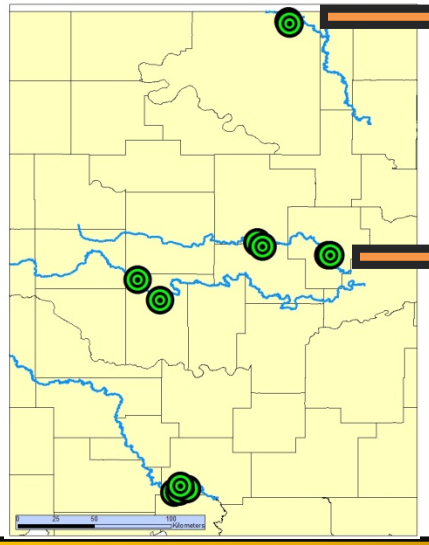
Use Support Assessment Protocols

- Water quality standards set to determine if aquatic resources are meeting pre-determined beneficial uses
- 130 reservoirs monitored (5 year rotation)
- 103 streams and rivers sites
  - Fixed and rotating stations
- Currently no Water Quality Standards for wetlands so beneficial uses default to Warm Water Aquatic Community

Turbidity, pH, DO, metals

Use Support Assessment Protocols

- Do stream or reservoir USAPs work for oxbows?
  - Test USAP on 12 oxbows
  - Caney, Deep Fork, N. Canadian and Washita Rivers
  - 6 Permanent/Semi-permanent
  - 6 Seasonal/Ephemeral
- Analysis in Progress



Seasonal oxbow on Caney River

Permanent oxbow on Deep Fork

Rapid Assessments

- Rapid assessments can be completed quickly
  - Two people half a day in the office and half a day in the field
- Provide a site score that reflects wetland condition
  - Ability to support and maintain structure and processes relative to reference sites with little to no human alteration.
- Useful for ambient monitoring of wetlands

Rapid Assessment

- Stressor based rapid assessment (OKRAM) in development based on data collected from oxbows and professional judgment
  - Hydrologic metrics
  - Water Quality metrics
  - Biotic metrics
- Will be tested this summer and calibrated with biotic data from depressional wetlands
  - Accuracy
  - Ease of use
  - Time
  - Repeatability (future effort)

Biotic Assessment

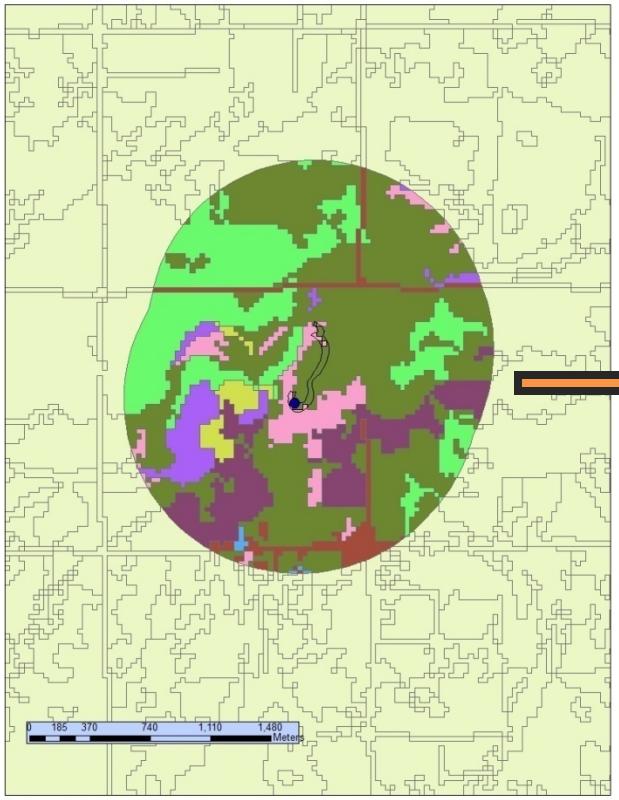
- Indices of Biotic Integrity (IBI) are multi-metric indices that use the biologic community to identify ecosystem impairment from anthropogenic activities
- Useful for:
  - More intensive site assessments
  - Biological criteria
  - Calibrating desktop and rapid assessments

Biotic Assessment

- Invertebrate and plant community data collected at 25 oxbows
- Analysis on how biotic metrics are impacted by both site and landscape disturbance is forthcoming.

Calibrating Desktop Assessment

- Compare landscape scores with water quality and biotic metrics
  - Are landscape scores reflected by site conditions?



Next Steps

- Analyze water quality data from 12 oxbows to determine if lake USAP is appropriate for oxbows (lake-like and wetland-like)
- Test OKRAM at depressional wetlands and calibrate with biotic data (e.g. macrophytes, algae and invertebrates)
- Analyze how biotic metrics based on invertebrate and macrophyte communities change with landscape and on-site stressors to determine the feasibility of IBIs
- Use biotic data and water quality data to calibrate the desktop landscape assessment.

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Questions?